February 16, 2015

Space for Growth

ANDREY YAKUNIN

In a year's time we will celebrate the 30th anniversary of one of mankind's boldest achievements — the launch of the first manned orbital space station, Mir, on Feb. 20, 1986. Exploration of the final frontier has been making headlines in recent months, with increasing public interest in this subject.

Recent achievements of the Philae lander gained plenty of attention in Russia, not least because the comet on which it touched down was named after Soviet astronomers. This European Space Agency project showed that government organizations are still among the most capable when it comes to groundbreaking achievements beyond Earth's atmosphere. Furthermore, the lander reached the Churyumov-Gerasimenko comet only a few weeks after a remarkably low-budget Indian satellite was launched into orbit around Mars, demonstrating that the industry is now a truly global race, not the old two-sided competition which was the norm during the Cold War years.

Nevertheless, despite recent progress in many countries beyond the traditional rivals, India and China in particular, the legacy of the 20th century has left both Russia and the United States with an enviable heritage of spaceflight achievements. Russia, heir of the Soviet space program, has been at the forefront of the industry from the onset: the first to launch a satellite into space, put a human into orbit, perform a spacewalk, send a woman into space and launch an orbital station, to name a few. The United States has also accomplished a great deal over the years, most notably having the first man walk on the moon, running robotics missions to Mars and launching the Hubble Space Telescope.

The expertise and experience built up since the Soviet period has fed into a Russian industry that today remains a world leader. Over the past few years, especially following the retirement of NASA's space shuttle, Russian rockets have been the only spacecraft capable of taking passengers to and from the International Space Station. A new cosmodrome is under construction in Russia's Far East, and in May the Russian government announced the injection of 1.8 trillion rubles ($52 billion) to boost various programs for the federal space agency, Roscosmos. In the newly global business of cosmic exploration, Russia has not hesitated to cooperate and share its capabilities with other countries. The Sea Launch program, established in 1995 as a consortium of four companies from Norway, Russia, Ukraine and the United States, and managed by Boeing, is the most vivid example.

More recently, Russian rockets took U.S. and Italian astronauts to the International Space Station on Expedition 42, despite suggestions that such collaborations could be threatened by recent geopolitical issues. The space industry and scientific community are likely to continue to look beyond politics, and rightly so.

Private Interest

Against the backdrop of achievement, particularly under governmental support in Russia, it is hardly surprising that the space sector is attracting greater interest from the private sector. Noting NASA's past successes in arranging private-sector partnerships and generating spinoffs that are attractive to investors, the notion of private investment in the space industry is becoming increasingly popular.

The number of private players in the Russian market remains relatively small, but promising developments are afoot.

Planet Labs, a San Francisco-based satellite imaging company operating dozens of tiny satellites that photograph Earth several times a day, announced Jan. 20 it had raised $95 million in funding to expand the sale of its satellite images and data. In the same week, Google, along with Fidelity Investments, made public a $1 billion investment in SpaceX, the Hawthorne, California company specializing in building and launching rockets and spacecraft. The deal reportedly has valued SpaceX at around $10 billion and is viewed as a move by Google to spread the reach of the Internet to more remote areas of the planet. This private investment in the United States, particularly by a multinational with a tech focus, shows the potential returns offered by this sector.

Of course, current efforts to see increasing private involvement in the industry are not without their skeptics. Recent accidents involving U.S. and European projects, including the crash of a Virgin Galactic craft, have raised questions about the viability of the industry and whether private operators can truly be trusted with such potentially risky technology. In response to concerns, Russia is taking a gradualist approach to private involvement, which is unsurprising considering the country's long history of cosmic success has been state-backed. The number of private players in the Russian market therefore remains relatively small, but promising developments are afoot.

Most significant so far has been the progress of Dauria Aerospace and Sputnix, two private companies affiliated with a new Space Technology and Telecommunications Cluster at Moscow's Skolkovo innovation park. Between them these firms have made several launches for commercial use, with Dauria already operating three satellites designed to provide data that can be integrated into both new and existing software applications. Dauria's technology is used to bring benefits to other spheres, from agriculture to natural disaster response and construction in remote locations (of which Russia has many!).

Even if Russia has so far struggled to generate investment-worthy spinoffs from its state program, these private efforts will make any number of corollary benefits

SEE *YAKUNIN* PAGE 17

Increased Competition Will Challenge ESA's Space Authority

CLEMENS RUMPF

Who should be in charge of European space activities, the European Space Agency or the European Union? The question is not new. With the Galileo program, the EU became the single biggest contributor to ESA's budget. As such, the EU has tried to gain more power over ESA. Both ESA and the EU are European organizations with space authority, so why should the responsibility for space activities be divided between two institutions?

Some think this division causes inefficiencies and increased overhead costs. The EU argues that all space activities should be conducted under the umbrella of the EU. The debate reached its height at the time of the ESA ministerial conference in 2012, when ESA was able to broadly retain its position and autonomy. ESA's impressive record of conducting successful space missions; designing and producing one of the world's most reliable launchers, the Ariane rocket family; and managing a European space industry that is competitive on a global scale certainly helped to reinforce ESA's arguments. So is the debate thus settled? No.

ESA was successful in the old world where space funding was provided by governments, resulting in a stable foundation for European (and global) space activities. The money for the space industry was secure and did not encourage risk-taking in the development of new space technologies. As a result, the space landscape has not changed much in the last 30 years. Technological details may have improved, but nothing much changed in the big picture. With a few exceptions, such as electric propulsion, innovation was limited to increasing efficiency of existing technologies. Access to space remained expensive, satellites continued to be big boxes incorporating many sensors, and the components of spacecraft and rockets became little more advanced than those used in the Apollo era. Additionally, we are not palpably closer to going beyond Earth orbit than 30 years ago.

This environment meant that launcher industries around the world were utterly surprised by the rise of SpaceX. They were surprised because the need to evolve launcher technology by a giant leap was not apparent to them. SpaceX shows that technology has advanced sufficiently in the last 30 years to enable new, game-changing approaches to space access. Why did none of the other launch providers even start to tap into this technological potential?

The answer is that they were too comfortable in their positions. They were not in an existential crisis because their launches were guaranteed by government contracts that do not encourage risk-taking. And, unfortunately, they were right. It is not only the fault of the launcher industry, but also the lack of vision and leadership in politics that brought upon today's situation.

The debate of who should be in charge of European space is not over. The surge of new players entering the space sector and an increasing amount of private funding are challenging the status quo. The new entrants are in the process of fundamentally changing how space is done, and ESA will feel the heat of this change with increasing intensity over the next several years. The first signs of cracks in the foundation of ESA have already become apparent.

The geographic return policy — guaranteeing 90 percent of a nation's investment in a program comes back in the form of industrial contracts — is a fundamental pillar of ESA's structure. At the core of this concept is the desire of European nations to develop their high-technology sectors and to engage in space activities. ESA member states pay a membership fee to ESA and get equivalently valued high-tech space contracts back to their industry as part of the agreement. This is the major incentive for smaller European countries to be members of ESA. They don't have the capability to bid for space contracts on a competitive basis but geographic return ensures their chance to win them none the less. In other words, geographic return does not aim to increase efficiency but has other goals, such as developing high-tech sectors in member nations.

This approach was feasible and successful in the old space world where governments were the primary funding body, which allowed for political motives, such as the preservation of jobs, to take precedence over performance. However, in a situation where the price gap for a given performance (say, developing a rocket) becomes sufficiently large, even governments cannot ignore efficiency considerations.

To illustrate the lack of efficiency in a policy driven industry, one can consider the development costs of Europe's Ariane 6 and SpaceX's Falcon 9. Ariane 6 is meant to save costs by utilizing heritage hardware resulting in a projected development cost of about $4 billion. In contrast, SpaceX states that Falcon 9 required an investment of about $400 million (including Falcon 1) to develop from scratch. Even when allowing for some inaccuracies in these numbers, it is obvious that efficiency has not been the only or first consideration in the history of European space.

Today we are entering an era where

SEE *RUMPF* PAGE 17